Teorie

Tuesday, February 1, 2022 4:28 PM

(compresor)

accelerația : $\frac{d^2x(t)}{dt^2}$

viteza : $\frac{dx(t)}{dt}$

(mișcare) deplasament : $x(t)$

pt cilindru

$A = \pi r^2$

$Q = A \cdot v$

debit — arie — viteză

$R = 8{,}31 \frac{J}{mol \cdot K}$

$P \cdot V = \rho R T$

(grafica)

Liniar inductanță

$\lambda = L \cdot i$

$T = T^* = \frac{1}{2L} \cdot \lambda^2 = \frac{1}{2} \cdot Li^2$

Liniar capacitanță

$q = C \cdot v$

$C = \varepsilon a / d$

$U = U^* = \frac{1}{2} Cv = \frac{1}{2C} \cdot q^2$

$$E = \int_0^T u \cdot i \, dt$$

$$\Theta_{ij} = \frac{(H_i - H_j)^q}{(f_{ij})^a}$$

(hydraulic network)

temp totală = T_{total} | temp ambiant = T_A | putere termică medie = I_m

(rezistență thermal)

$$\overline{T}_{total} = \overline{T}_A + \overline{P}_{med} \cdot R_T$$

curent mediu

$$P_{mediu} = \frac{1}{T} \cdot \int_0^T f(t) \, dt$$

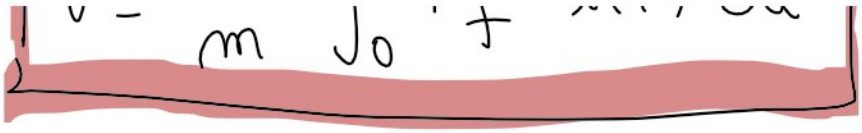
perioada

$f(t) = V \cdot I$ în cazul nostru

(problema voice coil actuator)

$$v = \frac{1}{m} \cdot \int_0^T K_f \cdot i(t) \, dt$$

$i(t)$ luăm de pe grafic, la noi două



grafic, la mai dură cazuri

ANALOGII

Mechanical-Electrical Analogy

$F = I$ Force is analogous to current

$v = V$ velocity is analogous to voltage

$\frac{1}{b} = R$ Inverse of the friction coefficient is analogous to resistance

$\frac{1}{k} = L$ Inverse of the spring constant is analogous to inductance

$M = C$ Mass is analogous to capacitance

Fluid flow-Electrical Analogy

$Q = I$ Flow rate is analogous to current

$p = V$ Pressure is analogous to voltage

$R_f = R$ Hydraulic resistance is analogous to resistance

$L_f = L$ Fluid inertia is analogous to inductance

$C_f = C$ Fluid capacitance is analogous to capacitance

Basic Relations in the Electrical and Thermal Domains

	Electrical Domain			Thermal Domain		
Through Variable *(FLOW)*	Current	I	Amperes or Coulombs/s	Power or heat flux	P_D	Watts or Joules/s
*Across V*ariable *(EFFORT)*	Voltage	V	Volts	Temperature	T	°C or K
Resistance	Electrical resistance	R	Ohms	Thermal resistance	$R_{\Theta AB}$	°C/W or K/W
Capacitance	Electrical capacitance	C	Farads or Coulombs/V	Thermal Capacitance	C_Θ	Joules/°C
„Ohm's Law"	$\Delta V_{AB}=V_A-V_B=I\cdot R_{AB}$			$\Delta T_{AB}=T_A-T_B=P_D\cdot R_{\theta AB}$ (derived from Fourier's Law)		